

# A Comparative Study of Basic Elements of Universe Revealed in Indian Philosophy and Modern Science

Dr. Bibhuti Lochan Sarma<sup>1</sup>, Ms. Dipanjali Devi<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Assamese, Bodoland University, Kokrajhar, BTR Assam, India

<sup>2</sup>M.Sc(Phy.), M.Phil, B.Ed, Assistant Teacher, Birjhora Girls HS School, Assam, India

## ABSTRACT

All living beings are formed out of five natural elements each of having its own properties. Five Elements of Nature called *pañcamahābhūta* clearly mentioned in different ancient Indian scripts like *sāmkhyadarśana*<sup>1</sup> *tarkasaṃgraha*<sup>2</sup> etc. *kṣitiḥ* (Earth/Prthivī), *apah* (Water), *Tejah* (Fire), Marut (Air), and *Vyomaḥ* (Space) along with various other forces of Nature sustain life and maintain equilibrium in nature. Imbalance of any form of these Elements leads to destruction of the nature and living being physically or mentally. Similar to these elements the Earth is also made up of five components-Atmosphere, Hydrosphere, Lithosphere, Mantle and Core. The basic properties of *Vyomaḥ* and Marut are seen in Atmosphere, that of *Tejah*'s in Mantle and core and Jala in the Hydrosphere<sup>3</sup>. In Vedas also we can find explanation about these elements which prove that the ancient *mantradraṣṭā ṛṣiḥ* are also knew the effect of these elements towards nature as well as to our body. All these elements are held together giving the appearance of a substance similar to the elements in atomic level by the force of attraction and repulsion in different ways. Matter is made up of the smallest particles known as atoms having mass and volume. By different types of bonding molecules are formed. The amount of matter in an object is called Mass and the volume is the space the object takes up. Depending on the arrangement of the atoms a matter can be classified as solid, liquid, gas, or plasma. In this paper we are trying to focus on philosophical, and scientific view with their ecological impact on our life.

**How to cite this paper:** Dr. Bibhuti Lochan Sarma | Ms. Dipanjali Devi "A Comparative Study of Basic Elements of Universe Revealed in Indian Philosophy and Modern Science" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-7 | Issue-3, June 2023, pp.1161-1168, URL: [www.ijtsrd.com/papers/ijtsrd58579.pdf](http://www.ijtsrd.com/papers/ijtsrd58579.pdf)



IJTSRD58579

Copyright © 2023 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



**KEYWORDS:** *kṣitiḥ* (Earth/Prthivī), *apah* (Water), *Tejah* (Fire), *Marut* (Air), and *Vyomaḥ* (Space)

## INTRODUCTION

According to the ancient study the universe is composed of five Elements of Nature viz. *kṣitiḥ* (Earth), *apah* (Water), *tejah* (Fire), *marut* (Air), *vyomaḥ* (Space) are called *pañcamahābhūta*. The *muṇḍako'paniṣada* also refer the five elements as *khaṁ, vāyu, jyoti, āpah and prthivī*

*“etasmājjāyateprāṇomanasarsvendriyāṇica khaṁvāyurjyotirāpahprthivīśvasya dharaṇī”<sup>4</sup>*

Similar to these elements the Earth is also made up of five components-Atmosphere, Hydrosphere, Lithosphere, Mantle and Core. The basic properties of *Vyomaḥ* and *Marut* can be seen in Atmosphere, that of *Tejah*'s in Mantle and core and Jala in the Hydrosphere. All these five elements are divided into two types viz. *Nitya* and *Anitya* according to the Indian philosophy. The *Nitya* is called *paramānūrūpa* (*sūkṣma*) and the *Anitya* is

*kāryarūpa* (*sthūla*). These are hidden but everything in the nature is composed of these elements in different forms. The five Elements of Nature are viz. Earth or Prthivī, Water or Jal, Fire or Agni, Air or Vayu and then Ether or Akasha exists in our body also maintaining the equilibrium in nature and in our body. The modern science also accept these elements in different state of matter as solid (Earth); liquid (water); plasma (Fire) and gas (air). Each of these elements has its own character. As these elements have a significant role towards the balanced state of nature and living organism therefore we should be responsible towards its values and to take some measures to sustain the equilibrium of the nature.

**Pañcamahābhūtas:** The five Basic Elements of Nature-*Kṣitiḥ* (Earth), *Apah* (Water), *Tejah* (Fire),

**Marut**(Air), and **Vyomah**(Space) called **Pañcamahābhūta**. All these five elements are devived into two type's viz. **Nitya** and **Anitya** according to the Indian philosophy. The **Nitya** is called **paramānurūpa** (**sūkṣama**) and the **Anitya** is Karyarupa(observable, **sthūla**). Each and every objects of the universe is made up of these pañcamahābhūtas with their **Nitya** and **Anitya**rupa. The **Nityarupa** cannot be perceived as they don't have the ability to give sensation to our sense organs because of their extreme subtlety. It is said in **sām̐khyakārika VII**

**atidūrātsām̐pyātindriyaghātānmano'navasthānāt|  
saukṣmyādyavadhānātabhībhavāt,  
samānābhīhārācca**<sup>5</sup>

According to modern science any matter is just a storehouse of electrical energy due its constituent particles. These energy strike our sense organs in terms of waves and create a sensation to our brain. Our brain analyse these wave signals and give a feeling about the matter as colour, taste, smell etc. The matter itself does not have any characteristics, it is only our perception of mind.<sup>6</sup>

### **Kṣitiḥ/Pr̥thivī(Earth)**

#### **Philosophical view:-**

**Kṣitiḥ/pr̥thivī** means the existence, capacitance(**Dharani**), of an object in terms of smell. It represent stability, permanence and rigidity giving

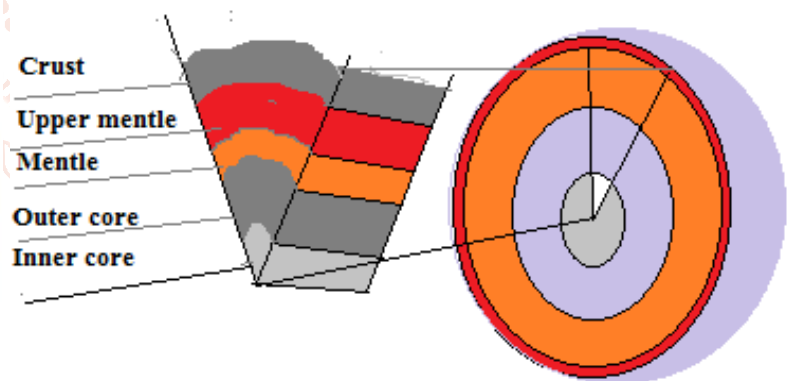
the solid state of matter. The element Earth makes us tolerant in our life. The **Pr̥thivī** has the basic characteristics of **gandha**. Again due to intermixing of qualities the **Pr̥thivī** has the qualities of sound(**śabda**), touch(**sparsa**), appearance(**rūpa**), taste(**rasa**) and smell(**gandha**)<sup>7</sup>. Due ti its fertilty and stability The Earth is worshiped as Goddess **Pr̥thivī**. We can have all the aspects of life: birth, life, death, and rebirth in the Earth. Here are two types of earth one is Eternal or (**Nitya**) which are in the form of atom (**Paramanu**). The other type is perishable (**Anitya**) which exists in the form of **Karya**. It can be assumed that in our body the sense organs are as a whole get the shape of **Jiva** or life which are perishable. On the other hand the elements or atoms are eternal as all the atoms get disintegrated to come back to its original eternal form after our death. So our body and its **Karya** or Works are perishable but the atom remains forever which are eternal. That means the earth is metaphysical.

#### **Earth:- modern scientific view**

The mass of the Earth is approximately  $5.98 \times 10^{24}$  kg. The elements found in Earth are iron (32.1%), oxygen (30.1%), silicon (15.1%), magnesium (13.9%), sulfur (2.9%), nickel (1.8%), calcium (1.5%), and aluminium (1.4%). There also some trace amounts of other elements of 12%. The core of the earth is believed to be in molten state primarily composed of iron (88.8%), with smaller amounts of nickel (5.8%), sulfur (4.5%), and less than 1% trace elements.<sup>8</sup>



**Fig:-Earth**<sup>9</sup>



**Fig.Different layers of Earth**

The geochemist F. W. Clarke calculated that about 47% of the Earth's crust consists of oxygen in the form of oxides like silica, alumina, iron oxides, lime, magnesia, potash and soda. The silica acts as acid, forms silicates, and contain in all the commonest minerals of igneous rocks present in the nature.

The interior of the Earth is divided into layers by their chemical or physical properties, with crust, mantle and distinct outer and inner core. The outer layer of the Earth is mainly composed of silicate that is solid crust, which is underlain by a highly viscous solid mantle. The thickness of the crust varies: averaging 6

km (kilometers) under the oceans and 30-50 km on the continents. The continental crust known as **SiAl** is made up of stones of mainly silicates and aluminium, sodium etc. The crust and the upper mantle are collectively known as the lithosphere of about 200 km. The tectonic plates are found in lithosphere. Beneath the lithosphere is the asthenosphere, which is a relatively low-viscous layer of about 80 to 200 km thick on which the lithosphere rides. Beneath the mantle, the deepest layer of about 3500 km thick with a liquid outer core of extremely low viscosity lies above a solid inner core.<sup>10</sup>

**WATER(*apah/jal*)****Phylosophical view**

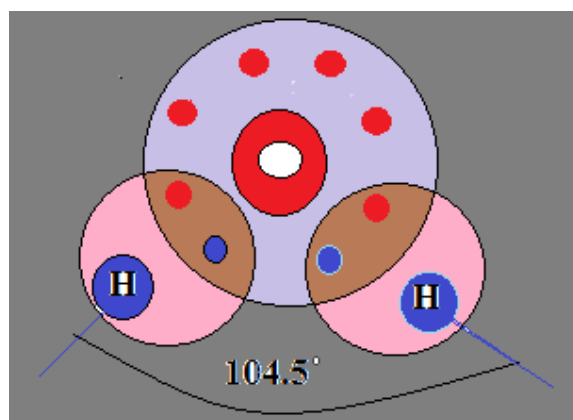
It can be touched and can be felt cool. It has the special characteristics of Rasa with Sabda, Sparcha and Pupa. It has the quality to flow i.e. fluidity, to keep together i.e. cohesive, to feel cool i.e. moisture etc. There are two types of water-*Nitya* and *Anitya*. The atomic configuration(paramanurup) of water is called *Nitya* or eternal in the shape of atom and its visible states as river, pond or sea (*karyarup*) is called *Anitya* or perishable. The God of Water is Barun. The water evaporates from river, pond or sea to the sky to form cloud and in the form of rain again comes to the earth. By this water cycle the Earth is nurtured and the earth becomes fertile, grow and mature. Water can be tested by the sense organ: Tongue.

**Water-Modern scientific view:-**

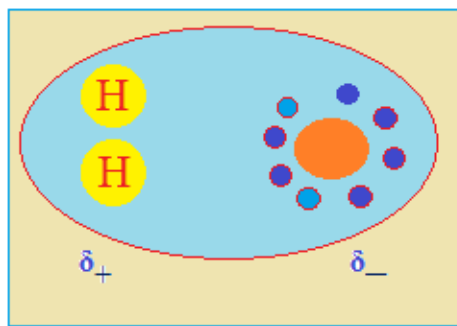
Water is made up of two Hydrogen (H) atoms and one Oxygen(O) atom as  $H_2O$ .

**Fig: water<sup>11</sup>**

By sharing a pair of electron each hydrogen atom is bounded to the central oxygen atom forming the Covalent bonding between them.

 **$H_2O$  molecule**

The distorted tetrahedral geometry of water molecule with angle  $104.5^\circ$  between the electron pairs ( $H-O-H$ ) is due to the strong repulsive force by the two nonbonding pairs of electrons towards the two covalent bonding pairs of electrons.<sup>12</sup>

 **$H_2O$  as Dipole**

Due to the nonuniformity of the charge distribution the  $H_2O$  molecule behaves like a dipole resulting hydrogen bonding between  $H_2O$  molecules. A  $H_2O$  molecule inside the liquid experience a force of attraction from all direction resulting net force zero. A molecule at the surface of the liquid experience a downwards attractive force and towards the side too creating the stretched-membrane effect called surface tension. Because of this effect a drop of water has the tendency to be spherical and an ant can walk on the surface of the water.

**Water in our body**

Water is the base of life. An adult human being have water about two-third of his weight within the cells and mostly in blood plasma. The transportation between cells and external environment can takes place with the help of this water acting as supporting fluid for blood cells. The main source of the water content of our body is drinking water while from our foods a sufficient amount of water is produced through the metabolic function within our body.

**FIRE(*tejah/agni*)****Phylosophical view**

Fire or Agni is another element of Pañcamahābhūta. The capacity to generate heat is the characteristics of fire. It has the characteristics of Rupa with Sabda and Sparcha. Fire(Tejah) means the inner energy, brilliancy, honesty, spirituality which altogether gives the brightness of an object. The brightness gives the appearance of the body as beauty(Rupa) According to Hindu Mythology there are four types of fire-fire of Earth, fire of Sky, fire of Stomach(means hunger and digestive power)and the fire we commonly use<sup>13</sup>.

**Fig:-Fire<sup>14</sup>**



Fire is one of the eight guardians of our universe known as Asta-dik-palakas(Asta-eight, dik-zone, palaka-gurdian)<sup>15</sup>. According to the *tarkasaṃgraha* the dik is “*prācyādivyavahāraheturdika*”<sup>16</sup>. The Fire is posited in the south-east of the universe. The heavenly bodies like Sun, Stars are the source of fire – high in the sky. Fire has the tendency to go upward. Fire escapes into the sky. It has the characteristics to create new things or destroy an old one. According to the śabdakalpadrumaḥ *agniḥ(pāvaka vāyusakhā pācana etc)* is explained as follows-

“*aṅgati ūrdham gacchatīti agniḥ*”<sup>17</sup>

That means the *agniḥ* fire that goes up

#### Scientific view

Fire is produce due to a chemical reaction called combustion which occurs at a particular point-ignition point. The Flames of fire consists of primarily of C<sub>2</sub>O, O<sub>2</sub>, N<sub>2</sub> and water vapour. To occur the chemical reaction oxygen, fuel and heat must be present which control the intensity of the flame. The fire is helpful if these are in controlled and otherwise it will be very dangerous. The fire can be extinguished if these factors are removed. Water is a very powerful element to control the fire. It takes away the heat of the fuel lowering the temperature than the ignition point. C<sub>2</sub>O also used as fire extinguisher because C<sub>2</sub>O acts as a blankets over the fuel so that O<sub>2</sub> supply is stopped from outside and thus fire will be under controlled. During combustion light, heat and smoke are produced due to chemical reaction. In our body the fire is the energy that can be absorbed by our body cells from the food we takes. Within our body the energy is released through the metabolic functions where combustion of food occurs by the oxygen during respiration.

#### Marut/bayu

##### Phylosophical view

The air moving within the body, which is called *prāṇaḥ*, the life-force, is also known as prana-pana etc because of its existence in different parts of the body. It is explained in the *tarkasaṃgraha* as follows-

“*śarīrāntaḥsañcārī vāyuh prāṇaḥ sa caikopādhibhedātpṛāṇāpānādisamjñā labhate*”<sup>18</sup>

Life cannot be expected without air as we breathe air to live and it is called as Prana. It is connected to the eternal soul and perishable life. Air can be felt as we breathe it in and out. The Vayu can divided in five subdivisions-

“*prāṇāpānādi- prāṇa apāna vyāna udāna samāna*”<sup>19</sup>  
“*vāyavahprāṇāpānavyānodānasamānāḥ*”<sup>20</sup>



Fig:-Air<sup>21</sup>

The Explanation of its variety of *vayu* or *Marut* can be found in the śabdakalpadrumaḥ, (khaṇḍa-4) as follows<sup>22</sup>

|                |  |
|----------------|--|
| <i>prāṇa-</i>  | “ <i>prāṇo nāma prāggamanavān nāsāgrasthānavartī</i> ”           |
| <i>apāna-</i>  | “ <i>apāno nāma avāggamanavān pāyū ādisthānavartī</i> ”          |
| <i>vyāna-</i>  | “ <i>vyāno nāma viśvaggamanavānakhilāśarīravartī</i> ”           |
| <i>udāna-</i>  | “ <i>udānaḥ kaṇṭhasthāntīya ūrvaṃnīgamanavāutkramaṇavāyuh</i> ”  |
| <i>samāna-</i> | “ <i>samānaḥ śarīramadhyagatāśitapūtānnādisamīkaraṇ akaraḥ</i> ” |

The *prana*, which moves forward, is situated at the tip of the nose. That means the air we take in breathing which is the base of our life. The *apana vayu* is second of the five energy subdivisions of *vayu* or *marut*. It has the influence in digestion, elimination and reproduction and it is active in the pelvic and lower abdominal areas like anus etc. It can be called as “descending air” as its direction of flow is downward. *Vyana* is the universal movement of the entire body. The *vyana vayu* is third of the five energy subdivisions of *prana*. The *vyana vayu* governs the functions of nerves, veins, joints and muscle and is a connecting force of energy, supporting the functions of the other four *vayus*. *Udana vayu* is forth of the five *vayus*, or subdivisions of *prana*. *Udana vayu* is located in the throat and flows in a circular manner around the neck and head. This *vayu* controls the speech, growth and self-expression. Its flows in the upward direction and hence known as “ascending air”. *Samana vayu* is fifth of the five *vayus* that make up *prana*. *Samana vayu* is believed to exist in the abdomen with the navel as its energy base and equalizer of cold, liquid, food and other things in the middle of the body. It is known as the “balancing air”

*“hṛdi prāṇo gude’pānaḥ samāno nābhisaṁsthitah udānaḥ kaṇṭhadeśastho vyānaḥ sarvaśarīragah”<sup>23</sup>*

The air present in the heart is the same as that in the anus, the air in the navel is the *samana vayu*.

*Udana vayu* is the exhalation in the region of the throat and goes through the whole body.

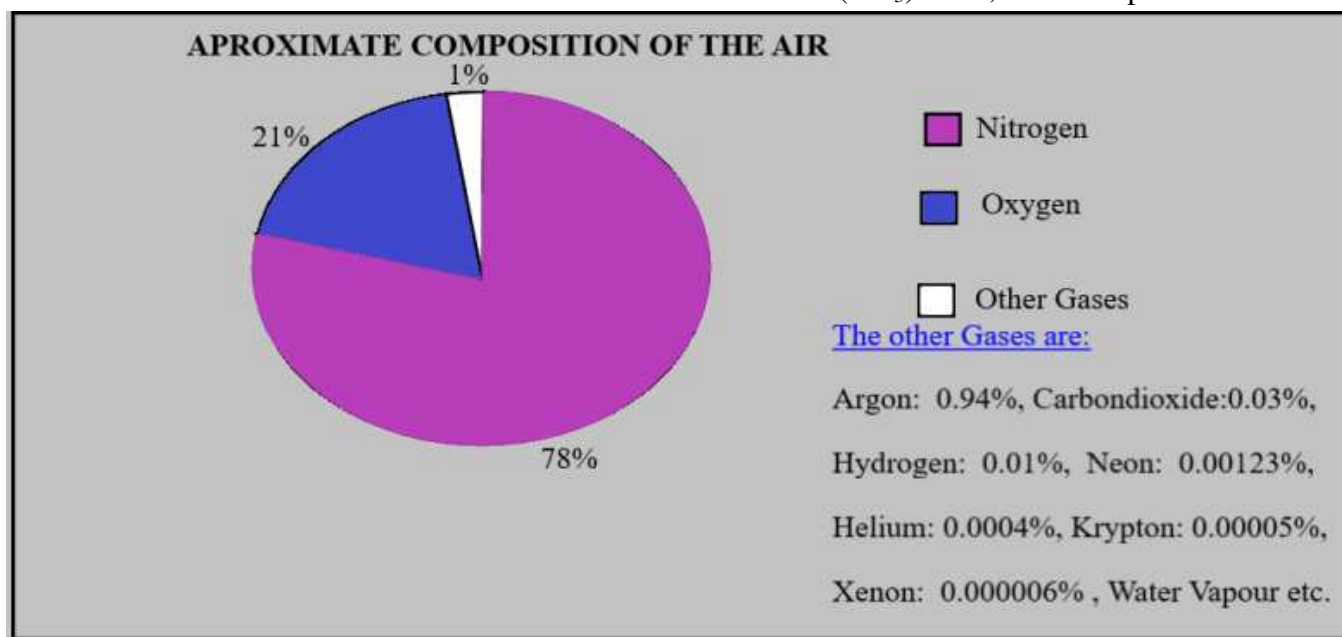
#### Scientific view

Air is the colorless gaseous form of matter without smell having indefinite shape and volume. It is mobile and dynamic and pure element we breathe in to sustain our life. In our body it moves in terms of oxygen and found in heart, lungs, mouth, nose etc. It has mass and weight thus exerting pressure from each

and every direction over the living beings at all the time. The pressure exerted by the air from outside is balanced by the pressure given by the air present inside us. Otherwise we would collapse down. Air forms the atmosphere around the earth different layers.

#### Composition of air

Nitrogen(N<sub>2</sub>)-- 78.084%, Oxygen (O<sub>2</sub>)-- 20.9476%, Argon (Ar)-- 0.934%, Carbon Dioxide (CO<sub>2</sub>) 0.0314%, Neon (Ne)-- 0.001818%, Methane (CH<sub>4</sub>)-- 0.0002%, Helium(He)- 0.000524%, Krypton (Kr)-- 0.000114%, Hydrogen(H<sub>2</sub>)-- 0.00005%, Xenon (Xe)-- 0.0000087%, Carbon Monoxide (CO) – trace, Ammonia(NH<sub>3</sub>)-trace, Water Vapour etc<sup>24</sup>



Among these oxygen is taken in by the animal and carbon dioxide is breathed out. Carbon dioxide is taken by the plants to manufacture their foods in presence of sunlight and water through the process called “photosynthesis”. Plants give off oxygen to the atmosphere to maintain the balance of oxygen-carbon dioxide.

#### Space(vyomaḥ/akash / ether)

##### Philosophical view

The another important natural element is space/sky/ether. Space does not mean emptiness it means the substance that is spread in such a way that it can carry other elements. It is said in *tarkasaṁgraha* and *bhāṣā pariccheda* that Sound is only quality of Akasha.

*“śabdaguṇakamākāśam taccaikaṁ vibhu nityam ca”<sup>25</sup>*

*“ākāśasya tu vijñeyah śabda vaiśeṣiko guṇah”<sup>26</sup>*

The air is the medium through which the sound propagates. It is said as an observation in According to *vakyapadiya* by **Bhartrhari** when the primordial mantra OM is uttered the sound is

Propagated like ripples, as when a piece of stone is dropped into a lake.<sup>27</sup>



**Fig: Space<sup>28</sup>**

Space has no limits, it is *anantha* i.e. unending or infinite where the entire galaxy (*brahmanda*) exists. Its main characteristics-sabda (sound) is linked with our sense organ Ear. The akasha or space in a room is the element of energy and dynamism. This space is known as brahmasthan allowing prana (energy) to flow freely. Ether is strong in north-eastern segment which is the most spiritual part of a structure and thus

considered as the best place for quiet thought, meditation and study. The structure should be built in such a way that the light enters its centre as well.

### Scientific view:-

The space or sky means cavity in which the solar system, the planets and core of the stars i.e. the entire universe is exist. Ether is the substance which carries all natural happenings. The distance which separates matter from each other is nothing but the space. Sound is the only characteristics of ether representing the entire spectrum of vibration. The source of sound is the vibration. When a material surface vibrates, the vibrations transferred to the nearest molecules of air. The vibrations acquired by nearest air molecules again transferred to the next plane of air molecules and so on. Finally the vibrations strikes eardrum of our sense organ i. e. ear. The vibration reach the brain, analysed and then we have the sensation of sound. Light, heat, waves, magnetic fields etc are the effective forces of sound. All the stars and the planets in the universe are surrounded by the space. In human body there is large number of organs like Nose, Ear, Mouth, in every joint, etc where cavities represent the sky element.

### Ecological value of the elements:-

There is a balanced condition between the above cited elements and living creatures where any sort of disturbances can causes lots of problems to the universe. We cannot live without these elements as they set a relationship with the human being and with the nature. In environment all the elements are inter-related having a great impact on each each other.

In ancient time Earth is called Vasudha as it contains all wealth. It supports verities of herbs in oceans, rivers, mountains, hills etc. We are dependent on earth for our food and prosperity. The earth provides us shelter, materials for clothes and land for agriculture. Our survival is impossible without her gift. The earth serves as universal mother for different types of plants, birds, animals. Nowadays our relationship with nature is changing due to exploitation of the planet creating a major issue for survival of the life. Because of deforestation land erosion, flood, durf, climate change etc. are now the major problems for the living organism on this planet.

Water is the source of live. All the organic beings such as vegetation, insects, worm, birds, animals, men etc. are dependable on water for their survival. Water acts as purifier destroying all kind of diseases. But now water is polluting with the advancement of industrialisation which has an affect on the agriculture as well as on the life of the creatures living in water and land with increasing diseases.

Air exist within all of us as life-breath. It can move everywhere and unpolluted air is the source of good health, happiness and long life. In modern days air pollution is another major problem for the living beings. Different types of toxic gases is realised to the air due to scientific and industrial achievements which affecting our respiratory system, skin, hair etc.

The Space or Ether or Akasha is in the vicinity of earth. There is a relation between ether and sound. The sound waves move in the sky at different frequencies. There is two type of ether –one inside our body and other outside the body. The modern advancing technology is now causing sound pollution affecting our hearing sensation and other physiological problems.

The natural elements are all life supporting materials which always provides us the beneficial raw materials. But unfortunately some of our scientific and industrial achievements are affecting the natural environment causing imbalance within the living beings. Human selfishness creating ecological crises to a great extent by degrading these elements rapidly on the global parameter. Greenhouse effect, global warming are now creating question on the existence of life on the planet. Modern technology and industries are polluting the environment releasing chemical wastage to water, air, soil and to the space. Automobile exhaust is causing acid rain which affects our ancient monuments

Nature is our friend not enemy. We born, grownup, live and play on the lap of the nature and nourished by her. We need to discharge our duty to giving back fraction of what we have taken from her. We should make a harmony with nature taking care of all the environmental elements. Nature is not to be destroyed but to be nourished making a responsible relationship with her.

### Conclusion:-

The five basic elements of the universe have its own characteristic. These elements are well explained in ancient time by the great sages. These five elements constitutes the nature are derived from *prakriti*, the primal energy and all are interrelated an interdependent. The human body is composed of these elements and each one is connected to the five senses. The human Nose is related to Earth as smell (Gandha), Tongue to Water (Rasha), Eyes to Fire (Rupa), Skin to Air (Sparsha) and Ears to Space (Sound). The bond between the elements and our senses is the basis of the relationship between nature and human beings. Philosophically and scientifically all these elements are interrelated to the human beings. They constitute our bodies. We are linked by



spiritually, psychologically and physically with the elements around us. We must be aware of the great forces of nature— exist within the Earth, the Water, the Fire, the Air and The Space—as well as all the various types of life, including plants and animals, which are bound to each other and try our best to keep balance between them.

## Notes and References

1. *sāmkhyadarśana* 2/10 pp.73
2. BhargavDayananda, ed. *tarkasaṃgraha*, p.6
3. SharanShambhuandPathakVidyavati ; CONCEPTS OF PANCHAMAHABHUT AT ELEMENTAL LEVEL, WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH, wjpmr, 2017, 3(7),80-89 <http://www.wjpmr.com/>
4. *muṇḍako'paniṣada*, 2/1/3
5. *sāmkhyakārika*, No-VII
6. Phukan Radhanath, Samkhyakarika of isvarakrsna, p.-24
7. Bhargav Dayananda, ed. *tarkasaṃgraha*, p.24-26
8. <https://mindmapcharts.com/index.php/gk/geography/533-composition-of-earth#:~:text=The%20geochemist%20F.%20W.%20Clarke%20calculate,usually%20much%20less%20than%201%25>.
9. [http://1.bp.blogspot.com/\\_STjZ5AcpHlk/Si000iOBHsI/AAAAAAAAABfQ/kWZj6X89f04/s1600-h/earth+transparent.png](http://1.bp.blogspot.com/_STjZ5AcpHlk/Si000iOBHsI/AAAAAAAAABfQ/kWZj6X89f04/s1600-h/earth+transparent.png)
10. <https://www.geeksforgeeks.org/interior-of-the-earth/>  
[http://3.bp.blogspot.com/\\_STjZ5AcpHlk/Si000i09piI/AAAAAAAAABfo/fKv1nnKHhG4/s1600-h/water.jpg](http://3.bp.blogspot.com/_STjZ5AcpHlk/Si000i09piI/AAAAAAAAABfo/fKv1nnKHhG4/s1600-h/water.jpg)
11. [https://upload.wikimedia.org/wikipedia/commons/3/36/Large\\_bonfire.jpg](https://upload.wikimedia.org/wikipedia/commons/3/36/Large_bonfire.jpg)
12. Water Molecular structure and Properties, Xiao-FengPang, p.3
13. <https://www.ibiblio.org/gautam/hind0003.htm>
14. <https://upload.wikimedia.org/wikipedia/commons/thumb/5/5b/DancingFlames.jpg/1200px-DancingFlames.jpg>
15. astadika <https://www.ibiblio.org/gautam/hind0003.htm>
16. BhargavDayananda, ed. *tarkasaṃgraha*, p.46
17. śāstrī, v. k.(2006). śabdakalpādrumāḥ(vol-1), p.8
18. Bhargav Dayananda, ed. *tarkasaṃgraha*, p.35
19. śabdakalpādrumāḥ, (khaṇḍa-4) p.341

20. ibid p.341
21. <https://media.istockphoto.com/id/1322716422/photo/thick-dark-black-heavy-storm-clouds-covered-summer-sunset-sky-horizon-gale-speed-windblowing.jpg?s=612x612&w=0&k=20&c=59zIPicaTb9U8SvJmNCwtArVwQtMaRuojh2X5R RRXBI=>
22. śabdakalpādrumāḥ, (khaṇḍa-4) 341
23. *Amarakosh* 1/67 ibid. 341
24. 1997 Reference: CRC Handbook of Chemistry and Physics, edited by David R. Lide,
25. *tarkasaṃgraha*, p.43
26. *bhāṣā pariccheda*, p.59
27. Grammarians on shabdapratyakṣa by S.T. Nagaraj, also Nature and perception of sound by N.T. Srinivasa Iyengar. In sense perception in science and shastras, conference proceedings, Ankara Mutt, Bangalore 560 004, India.
28. <https://media.istockphoto.com/id/177247796/photo/night-sky-filled-with-stars-and-nebulae.jpg?s=612x612&w=0&k=20&c=x9Y2ztO09G0LKzbZwcc9LBL6wjQ9NXfZaf1XrfaMuA=>

## Bibliography

- [1] Lide, David R., ed. CRC Handbook of Chemistry and Physics. 1997.
- [2] Madhavananda, Swami, ed. bhāṣā pariccheda. Trans. Swami Madhavananda. Swami Pavitranda, Precedent Advaita Asrama, Mayavati, Almora, n.d.
- [3] muṇḍako'paniṣada. THE PRESIDENT, SRI RAMAKRISHNA MAT\$ Mylapore Madras, 4th Edition OU\_1 6077.
- [4] Phukan, Radhanath, ed. sāmkhyakārika. Firma k.l. Mukhopadhyay, 6/1A, Banchharam Ankur Lane Calcutta 12, 1960.
- [5] Saraswati, Swami Darsananda, trans. sāmkhyadarśana. Saraswati Pustak Bhandar, 1936.
- [6] śāstrī, v. k., ed. śabdakalpādrumāḥ(vol-1-5). Nag Publisher, 11A/U.A. Jawahar Nagar, Delhi-7, 2006.
- [7] Xiao-FengPang. Water Molecular structure and Properties. World Scintific Publishing, Co. Pte. Ltd. 27 Waren Street, USA, 1945.

## Conference Proceedings

- [1] Grammarians on shabdapratyakṣa by S.T. Nagaraj, also Nature and perception of sound

by N.T. Srinivasa Iyengar. In sense perception in science and shastras, conference proceedings, Ankara Mutt, Bangalore 560 004, India.

## Journals

- [1] WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH, wjpmr,2017,3(7),80-89  
<http://www.wjpmr.com/>

## Web Links

- [1] <https://mindmapcharts.com/index.php/gk/geography/533-composition-of-earth#:~:text=The%20geochemist%20F.%20W.%20Clarke%20calculated,usually%20much%20less%20than%201%25.>
- [2] [http://1.bp.blogspot.com/\\_STjZ5AcpHlk/Si000iOBHsI/AAAAAAAAABfQ/kWZj6X89f04/s1600-h/earth+transparent.png](http://1.bp.blogspot.com/_STjZ5AcpHlk/Si000iOBHsI/AAAAAAAAABfQ/kWZj6X89f04/s1600-h/earth+transparent.png)
- [3] <https://www.geeksforgeeks.org/interior-of-the-earth/>

- [4] [http://3.bp.blogspot.com/\\_STjZ5AcpHlk/Si000i09piI/AAAAAAAAABfo/fKv1nnKHhG4/s1600-h/water.jpg](http://3.bp.blogspot.com/_STjZ5AcpHlk/Si000i09piI/AAAAAAAAABfo/fKv1nnKHhG4/s1600-h/water.jpg)
- [5] [https://upload.wikimedia.org/wikipedia/commons/3/36/Large\\_bonfire.jpg](https://upload.wikimedia.org/wikipedia/commons/3/36/Large_bonfire.jpg)
- [6] <https://upload.wikimedia.org/wikipedia/commons/thumb/5/5b/DancingFlames.jpg/1200px-DancingFlames.jpg>
- [7] <https://www.ibiblio.org/gautam/hind0003.htm>
- [8] <https://media.istockphoto.com/id/1322716422/photo/thick-dark-black-heavy-storm-clouds-covered-summer-sunset-sky-horizon-gale-speed-wind-blowing.jpg?s=612x612&w=0&k=20&c=59zIP1caTb9U8SvJmNCwtArVwQtMaRuojh2X5RRRXBI=>
- [9] <https://media.istockphoto.com/id/177247796/photo/night-sky-filled-with-stars-and-nebulae.jpg?s=612x612&w=0&k=20&c=x9Y2ztO09G0LKzb-Zwcc9LBL6wjQ9NXfZaf1XrfaMuA=>

